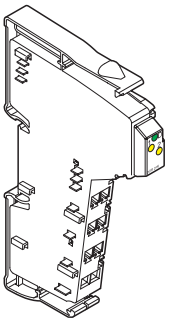
IB IL 24/48 DOR 2/W
IB IL 24/48 DOR 2/W-PAC

Inline Terminal
With Two SPDT (Form C) Relays



Data Sheet 685000 12/2003 68500001

Danger from undefined system state

By default, the relay contact positions of the terminal are not defined. Power cycle (on/off) the terminal completely before connecting the segment voltage in order to avoid undesirable system states.

The IB IL 24/48 DOR 2/W and IB IL 24/48 DOR 2/W-PAC only differ in the scope of supply (see "Ordering Data" on page 16). Their function and technical data are identical.

For greater clarity, the Order Designation IB IL 24/48 DOR 2/W is used throughout this document.

This data sheet is only valid in association with the IB IL SYS PRO UM E User Manual or the Inline System Manual for your bus system.

The terminal must only be used in the SELV area (up to 50 V AC or 120 V DC, maximum).

Function

The terminal is designed for use within an Inline station. It has two SPDT (Form C) relay contacts, which are independent of each other.

Features

- Two SPDT (Form C) relays
- Floating connections for two actuators
- Nominal current of the output: 2 A
- Total current of the terminal: 4 A
- Diagnostic and status indicators
- Segment voltage U_S

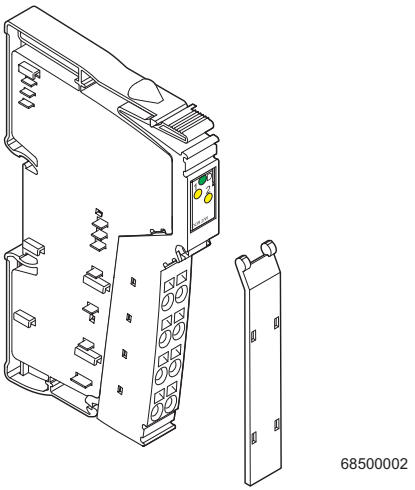


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Figure 1 IB IL 24/48 DOR 2/W-PAC

Special Features of the IB IL 24/48 DOR 2/W Terminal

Switching a Voltage Equal to the Segment Voltage

The potential U_S is available at the terminal points 1.1 and 1.2.

Inserting a jumper between 1.1 and 1.3 or 2.1 and 2.3 enables connecting the segment voltage potential to the main contact of the relevant relay in order to switch the load in a **non-floating** manner.

If no jumpers are inserted, switching the load can also be **floating**.

Switching a Voltage Unequal to the Segment Voltage

– Different DC voltages

Distance terminals are not required.

Inserting a jumper is not useful and not permitted. It is only permitted to switch the load in a **floating** manner.

If the switch contact potentials and the segment circuit potential are two different DC circuits, Phoenix Contact recommends using a ground connection between the two power supply units.

– Switching an AC voltage within a DC segment circuit

Distance terminal must be used.

The distance terminals interrupt the potential jumpers. As a result, no segment voltage is present at the terminal points 1.1 and 2.1. It is only possible to switch the connected load in a **floating** manner.

When switching voltages outside the SELV area, use the Inline terminals IB IL 24/230 DOR 1/W or IB IL 24/230 DOR 4/W.

General Description

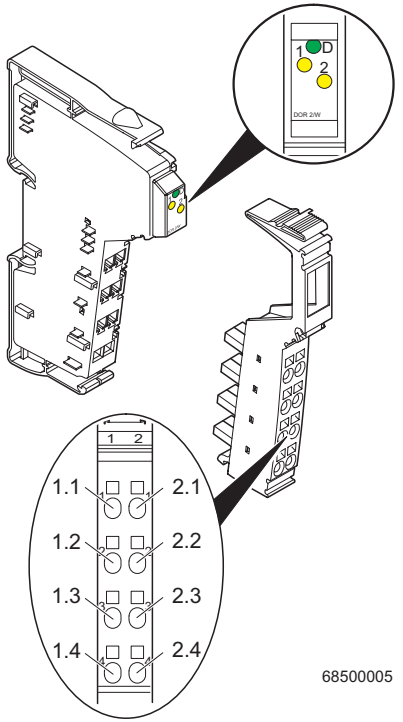


Figure 2 IB IL 24/48 DOR 2/W with appropriate connector

Function Identification

Pink

Housing/Connector Color

Green housing

Green connector, without color print

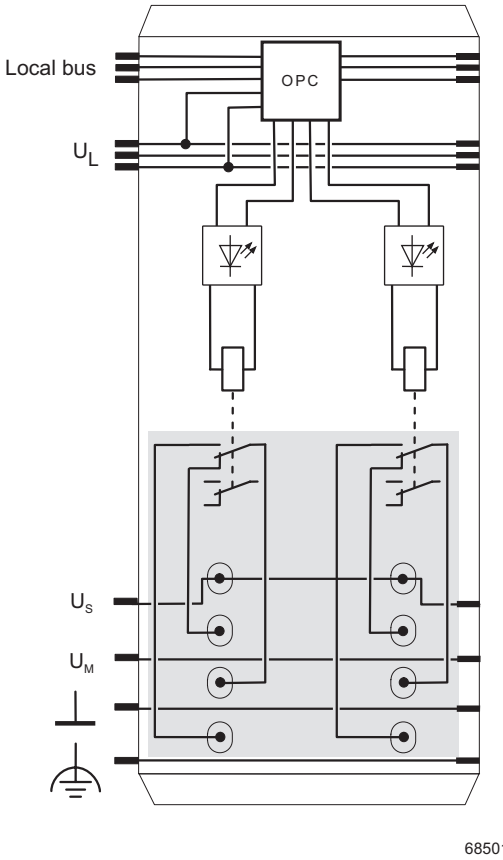
Local Diagnostic and Status Indicators

Des.	Color	Meaning
D	Green	Diagnostics
1	Yellow	Output status indicator (relay energized)
2	Yellow	Output status indicator (relay energized)

Terminal Assignment

Terminal Points	Assignment
1.1, 2.1	Segment voltage U_S
1.2	N/C contact of relay 1
1.3	Main contact of relay 1
1.4	N/O contact of relay 1
2.2	N/C contact of relay 2
2.3	Main contact of relay 2
2.4	N/O contact of relay 2

Internal Circuit Diagram



Key:

OPC — Protocol chip (bus logic including voltage conditioning)

LED

Relay, SPDT (Form C)

Electrically isolated area
I/O area including relay contact isolated from the logic area including the relay coil

Other symbols used are explained in the IB IL SYS PRO UM E User Manual or the Inline System Manual for your bus system.

Figure 3 Internal wiring of the terminal points

Connection Examples

Connecting Actuators

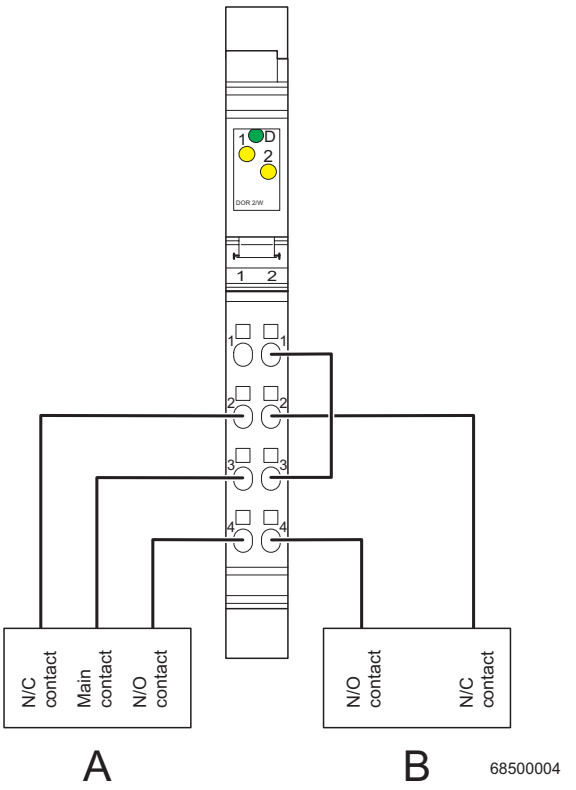


Figure 4 Typical connection of the actuators

A Floating actuator connection

B Non-floating actuator connection

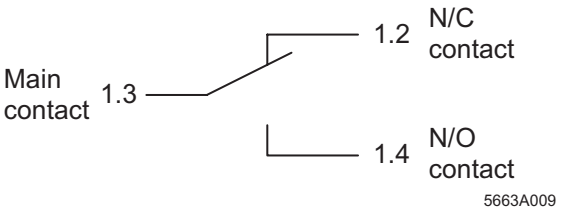


Figure 5 Output relay Form C contacts

Switching Voltages That Are Not Available in the Segment

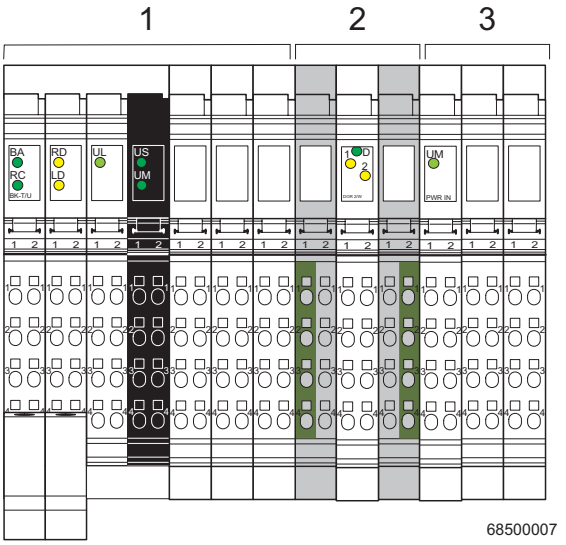


Figure 6 Example: switching 48 V within a 24 V area

1 24 V area consisting of bus terminal and I/O terminals

2 IB IL 24/48 DOR 2/W terminal separated from the 24 V area by distance terminals

3 24 V area consisting of a power terminal and I/O terminals

See also "Special Features of the IB IL 24/ 48 DOR 2/W Terminal" on page 2.

As the distance terminals interrupt all the potential jumpers, U_S is not available at the terminal points 1.1 and 2.1 in this case. In this case the connected load can only be switched in a floating manner.

Switching Voltages That Are Available in the Segment

Distance terminals are not required when switching e.g., a 24 V channel within a 24 V area.

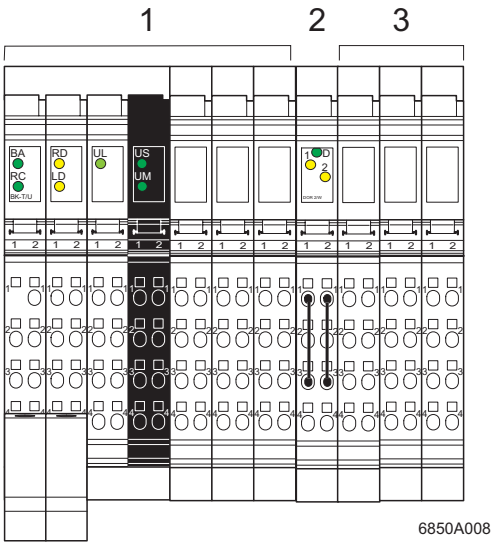


Figure 7 Switching 24 V within a 24 V area

1 24 V area consisting of bus terminal and I/O terminals

2 IB IL 24/48 DOR 2/W terminal

3 24 V area consisting of I/O terminals or a power terminal and I/O terminals

When using several IB IL 24/48 DOR 2/W terminals Phoenix Contact recommends creating a separate main circuit with separate supply.

Interference Suppression Measures on Inductive Loads/ Switching Relays

Each electrical load is a mixture of ohmic, capacitive, and inductive elements. Depending on the proportion of the element, switching these loads results in a larger or smaller load on the switch contact.

In practice, loads are generally used with a large inductive element, such as contacts, solenoid valves, motors, etc. Due to the energy stored in the coils, voltage peaks of up to several thousand volts may occur when the system is switched off. These high voltages cause an arc, which may destroy the controlling contact through material evaporation and material transfer.

This pulse, which is similar to a square wave pulse, emits electromagnetic pulses over a wide frequency range with a large amount of power and with spectral elements reaching several MHz.

To prevent such arcs from occurring it is necessary to fit the contacts/loads with protective circuits. The following protective circuits can be used:

– Contact protective circuit
– Load protective circuit
– Combination of both protective circuits

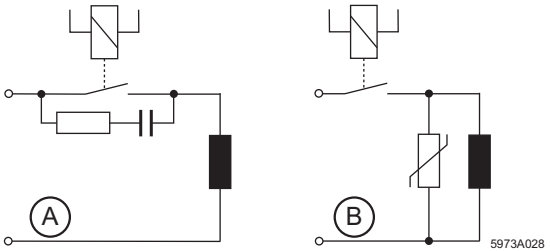


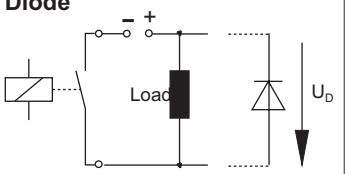
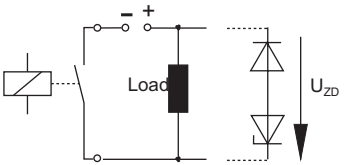
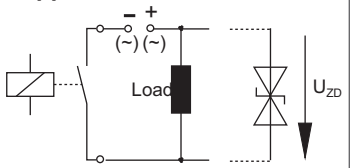
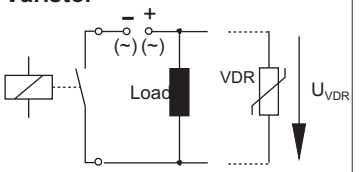
Figure 8 Contact protective circuit (A), load protective circuit (B)

If sized correctly, these circuit versions do not differ greatly in their effectiveness. In principle, a protective measure should be directly implemented at the source of the interference. The following points speak in favor of a load protective circuit:

– When the contact is open, the load is electrically isolated from the operating voltage.
– It is not possible for the load to be activated or to "stick" due to undesired operating currents, e.g., from RC elements.
– Shutdown voltage peaks cannot be coupled in control lines that run in parallel.

Phoenix Contact provides protective circuit solutions in terminal format or in electronic housing (see the "CLIPLINE" catalog or "TRABTECH" catalog). Additional information is available on request. In addition to this, today the majority of contactor manufacturers offer diode, RC or varistor elements that can be snapped on. For solenoid valves, connectors with an integrated protective circuit can be used.

Circuit Versions

Load Protection	Additional Delay	Defined Induction Voltage Limitation	Bipolar Effective Attenuation	Advantages/Disadavantages
Diode 	Long	Yes (U_D)	No	Advantages: - easy implementation - cost-effective - reliable - uncritical dimensioning - low induction voltage Disadvantages: - attenuation only via load resistor - long off delay
Series connection diode/zener diode 	Medium to short	Yes (U_{ZD})	No	Advantages: - uncritical dimensioning Disadvantages: - attenuation only above U_{ZD}
Suppressor diode 	Medium to short	Yes (U_{ZD})	Yes	Advantages: - cost-effective - uncritical dimensioning - limitation of positive peaks - suitable for AC voltage Disadvantages: - attenuation only above U_{ZD}
Varistor 	Medium to short	Yes (U_{VDR})	Yes	Advantages: - high power absorption - uncritical dimensioning - suitable for AC voltage Disadvantages: - attenuation only above U_{VDR}

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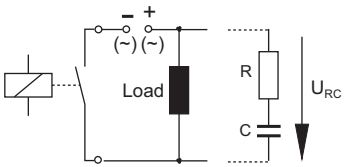
RC Circuit Versions

RC Connected in Series:

Load Protection	Additional Off Delay	Defined Induction Voltage Limitation	Bipolar Effective Attenuation	Advantages/Disadvantages
R/C combination  	Medium to small	No	Yes	Advantages: - HF attenuation via power storage - suitable for AC voltage - level-independent attenuation - reactive-current compensating Disadvantages: - exact dimensioning required - high inrush current

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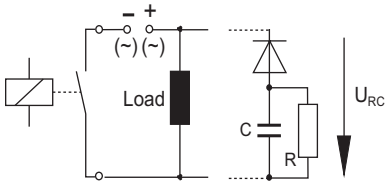
Sizing:

– Capacitor: $C \approx L_{Load}/4 \times R_{Load}^2$

– Resistor: $R \approx 0.2 \times R_{Load}$

RC Parallel Circuit With Series Diode

Load Protection	Additional Off Delay	Defined Induction Voltage Limitation	Bipolar Effective Attenuation	Advantages/Disadvantages
R/C combination with diode  	Medium to small	No	Yes	Advantages: - HFattenuation via power storage - level-independent attenuation - Current inversion not possible Disadvantages: - exact dimensioning required - only suitable for DC voltage

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Sizing:

– Capacitor: $C \approx L_{Load}/4 \times R_{Load}^2$

– Resistor: $R \approx 0.2 \times R_{Load}$

Switching AC/DC Loads

Switching Large AC Loads

When switching large AC loads, the relay can be operated up to the corresponding maximum values for switching voltage, current, and power. The arc that occurs during shutdown depends on the current, voltage, and phase angle. This shutdown arc switches off automatically the next time the load current passes through zero.

In applications with an inductive load, an effective protective circuit must be provided, otherwise the life of the system will be reduced considerably.

To prolong the life of the IB IL 24/48 DOR 2/W terminal as much as possible when using lamp loads or capacitive loads, the current peak must not exceed 2 A when the load is switched on.

Switching Large DC Loads

In DC operation, a relay can only switch a relatively low current compared with the maximum permissible alternating current. This maximum direct current value is also highly dependent on the voltage and is determined in part by design conditions, such as the contact distance and contact opening speed.

The corresponding current and voltage values are shown using the example in Figure 9.

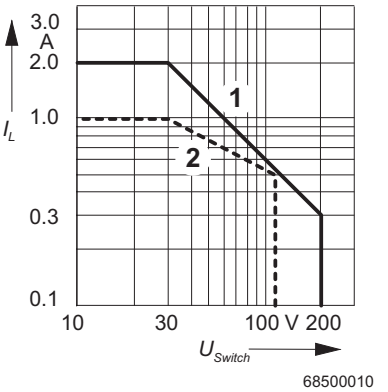


Figure 9 DC load limiting curve (REL-SNR-1XU/G 5 GOLD LIEG relay)

I Switching current in A

U Switching voltage in V

Definition of the load limiting curve: For 1000 cycles, no constant arc should occur with a burning life of >10 ms.

An unattenuated inductive load further reduces the values for switching currents given here. The energy stored in the inductor can cause an arc to occur, which forwards the current via the open contacts. Using an effective contact protective circuit, the same currents can be switched as for an ohmic load and the life of the relay contacts is the same.

If it is permitted to switch higher DC loads, several relay contacts can be switched in parallel.

Additional technical data is available on request.

Programming Data/Configuration Data

INTERBUS

ID code	BD_{hex} (189_{dec})
Length code	$2C_{hex}$
Process data channel	2 bits
Input address area	0 bits
Output address area	2 bits
Parameter channel (PCP)	0 bits
Register length (bus)	2 bits

Other Bus Systems

For the programming data/ configuration data of other bus systems, please refer to the appropriate electronic device data sheet (GSD, EDS).

Process Data

Meaning of the OUT Process Data Assignment

(Byte.bit) view		0.1	0.0	Meaning	
				N/O Contact 2 (Contact 2.4)	N/O Contact 1 (Contact 1.4)
Possible bit combinations		0	0	Open	Open
		0	1	Open	Closed
		1	0	Closed	Open
		1	1	Closed	Closed
Status indicator	LED	The LED lights up if the corresponding N/O contact is closed.		2	1

For the assignment of the illustrated (byte.bit) view to your INTERBUS control or computer system, please refer to DB GB IBS SYS ADDRESS data sheet, Part No. 90 00 99 0.

Technical Data

General Data	
Order designation Order no.	IB IL 24/48 DOR 2/W 28 62 97 4 IB IL 24/48 DOR 2/W-PAC 28 63 11 9
Housing dimensions (width x height x depth)	12.2 mm x 120 mm x 71.5 mm (0.480 in. x 4.724 in. x 2.815 in.)
Weight	48 g (without connector); 63 g (with connector)
Operating mode	Process data mode with 2 bits
Transmission speed	500 kbaud
Connection method for actuators	To two floating relay changeover contacts
Permissible temperature (operation)	-25°C to +55°C (-13°F to +131°F)
Permissible temperature (storage/transport)	-25°C to +85°C (-13°F to +185°F)
Permissible humidity (operation)	75% on average, 85% occasionally

In the range from -25°C to +55°C (-13°F to +131°F) appropriate measures against increased humidity (> 85%) must be taken.

Permissible humidity (storage/transport)	75% on average, 85% occasionally

For a short period, slight condensation may appear on the outside of the housing if, for example, the terminal is brought into a closed room from a vehicle.

Permissible air pressure (operation)	80 kPa to 106 kPa (up to 2000 m [6562 ft.]above sea level)
Permissible air pressure (storage/transport)	70 kPa to 106 kPa (up to 3000 m [9843 ft.] above sea level)
Degree of protection	IP20 according to IEC 60529

Interface	
Local bus	Through data routing

Power Consumption	
Communications power	7.5 V
Current consumption from the local bus	30 mA
Power consumption from the local bus	0.23 W

Supply of the Module Electronics and I/O Through Bus Terminal/Power Terminal	
Connection method	Through potential routing

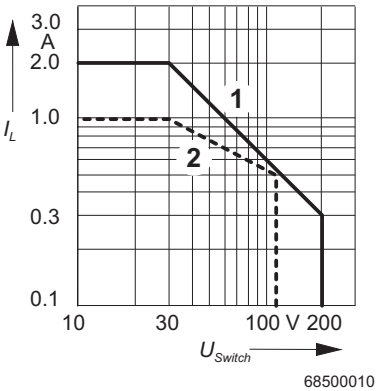
Relay Output	
Number	2
Contact material	$AgSnO_2$, hard gold-plated
Contact resistance	75 mΩ
Limiting continuous current (at maximum ambient temperature)	2 A
Maximum switching voltage	50 V AC, 120 V DC
Maximum switching power (AC/DC)	60 W, 62.5 VA (ohmic load)
Minimum load	10 mV DC; 10 µA
Switching current at 30 V DC	2 A
Switching current at 60 V DC	1.0 A

See also the Table entitled "Maximum Switching Current for Ohmic Load Depending on the Switching Voltage" on page 14.

Nominal power consumption of the coil (at 20°C [68°F])	200 mW, bistable relay, no power in the switched state
Resistance of the coil (at 20°C [68°F])	178 Ω ±10%
Maximum switching frequency (without load)	1 Hz
Maximum switching frequency (with nominal load)	1 Hz
Response delay	20 ms, typical
Bouncing time	4 ms with on and off
Release time	20 ms, typical
Mechanical life	10^8 cycles
Electrical life (30 V DC, 1 A)	2 x 10^5 cycles
Common potentials	All contacts floating

Maximum Switching Current for Ohmic Load Depending on the Switching Voltage	
Switching Voltage (V DC)	**Switching Current (A)**
10	2.0
20	2.0
30	2.0
60	1.0

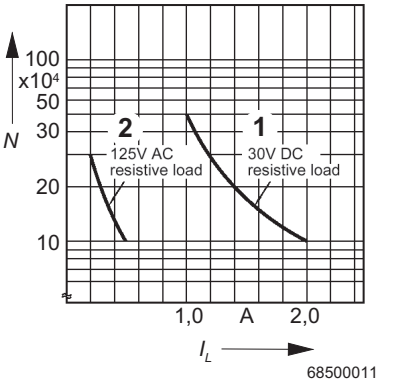
Load Current (I_L in A) as a Function of the Switching Voltage (U_{switch} in V)



1 DC, ohmic load

2 AC, ohmic load

Number of Operations (N x 10^4) as a Function of the Load Current (I_L in A)



1 30 V DC, ohmic load

2 125 V AC, ohmic load

Power Dissipation
Formula to Calculate the Power Dissipation in the Terminal
$P_{EL} = P_{BUS} + P_L$ $P_{EL} = 0.23\ W + m \times 0.14\ W + \sum_{n=1}^{2} [\ I_{Ln}^2 \times 0.075\ ]$
Where P_{EL} Total power dissipation in the terminal P_{BUS} Power dissipation through bus operation P_L Power dissipation through the load current via the contacts n Index of the number of loaded outputs n = 1 to 2 m Number of relays with controlled coil I_{Ln} Load current of the output n
Power Dissipation of the Housing Depending on the Ambient Temperature
$P_{HOU} = 1.2\ W$ $-25°C < T_A \leq +25°C$ $P_{HOU} = 1.2\ W - ((T_A - 25°C) \times 0.02\ W/°C)$ $+25°C < T_A \leq +55°C$ Where P_{HOU} Permissible power dissipation of the housing T_A Ambient temperature

Derating When Using the N/O Contact			
Ambient temperature T_A	Power dissipation of the housing	Maximum load current (100% simultaneity)	Maximum load current (50% simultaneity)
40°C (104°F)	0.9 W	2.0 A	2.0 A
55°C (131°F)	0.6 W	1.0 A	2.0 A

Safety Equipment
None

Error Messages to the Higher-Level Control or Computer System
None

Air and Creepage Distances (According to EN 50178, VDE 0109, VDE 0110)			
Isolating Distance	**Air Distance**	**Creepage Distance**	**Test Voltage**
Relay contact/bus logic	≥ 1.5 mm (0.059 in.)	≥ 1.5 mm (0.059 in.)	1.5 kV, 50 Hz, 1 min
Contact/contact	≥ 1.5 mm (0.059 in.)	≥ 1.5 mm (0.059 in.)	1 kV, 50 Hz, 1 min
Contact/PE	≥ 3.1 mm (0.122 in.)	≥ 3.1 mm (0.122 in.)	1 kV, 50 Hz, 1 min
Relay/relay	None		

Ordering Data

Description	Order Designation	Order No.
Terminal with two digital relay outputs; including connector and labeling field	IB IL 24/48 DOR 2/W-PAC	28 63 11 9
Terminal with two digital relay outputs	IB IL 24/48 DOR 2/W	28 62 97 4
The listed connector is needed for the complete fitting of the IB IL 24/48 DOR 2/W terminal.		
Connector with eight spring-cage connections (green, w/o color print); pack of 10	IB IL SCN-8	27 26 33 7
Accessories		
Distance terminal for isolating different voltage areas; pack of 1 set (2 terminals) including connectors and labeling fields	IB IL DOR LV-SET-PAC	28 61 64 5
Distance terminal for isolating different voltage areas; pack of 1 set (2 terminals)	IB IL DOR LV-SET	27 42 64 1
The listed connector set is needed for the complete fitting of the IB IL DOR LV-SET terminal.		
Connector for IB IL DOR LV-SET; pack of 1 set (2 pieces)	IB IL DOR LV-PLSET	27 42 66 7

Description	Order Designation	Order No.
Documentation		
"Configuring and Installing the INTERBUS Inline Product Range" User Manual	IB IL SYS PRO UM E	27 43 04 8

Make sure you always use the latest documentation.
It is available on the Internet at www.phoenixcontact.com.

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